

**THE X-RAY WEAKNESS OF GPS RADIO GALAXIES: A VOLUME-LIMITED
COMPLETE SAMPLE**

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The XMM-Newton observations of the GPS sample was completed last summer. We are in process of finalizing the paper describing the data and the results. The main goal of the project was to determine the X-ray spectra of the GPS galaxies in comparison to regular radio galaxies. Our XMM observations show evidence that the GPS galaxies are heavily obscured with the large absorbing columns exceeding $N(H) > 10^{22} \text{ cm}^{-2}$. Taking into account the obscuration we determined that the intrinsic X-ray luminosities of GPS galaxies are of order 10^{43} - 10^{44} erg/s , comparable to low luminosity radio loud quasars. The large GPS samples can confirm the result, as at this moment our evidence is based only on 7 GPS galaxies observed with good S/N/ in X-rays.

The first paper summarizing the results of the XMM observation of Mkn 668 has been published Astronomy & Astrophysics. We found soft X-ray signatures of a hot plasma ($kT \sim 10^7 \text{ K}$) and a hard X-ray emission from the nucleus. The X-ray spectrum above 2.5-keV is characterized by a very flat (observed photon index, $\Gamma \sim 0.5$) power-law continuum, alongside with a strong Fe-K-alpha neutral iron fluorescent line ($EW \sim 600 \text{ eV}$). The best explanation for the origin of this high energy X-ray emission is in terms of the Compton-reflection of the nuclear emission. The primary X-ray emission is obscured by a Compton-thick ($N_H \sim 10^{24} \text{ cm}^{-2}$) matter which becomes transparent at higher energies. The observed above 2.5-keV X-rays are mostly due to reflection which is indicated by a strong Fe-K-alpha line. This source represented the second hard X-ray detection of the GPS galaxy ever (the first one being 1345+125; O'Dea et al. 2000).

The observations of the other GPS galaxies in our sample confirmed the trend of the large obscuration present in the spectra. However, we do not have a compelling evidence for a hot gas in the nucleus. The two other GPS galaxies observed with Chandra were added to the total of 7 GPS galaxies. This GPS sample was compared against the sample of radio loud galaxies and quasar. The paper is about to be submitted.

Our preliminary results based on the XMM-Newton data for the entire sample were presented at the meeting in July 2004.

Publications:

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1. Guainazzi, M., Siemiginowska, A., Rodriguez-Pascual, P., & Stanghellini, C. \ 2004, A\&, 421, 461
 2. Guainazzi, M., Siemiginowska, A. et al 2005, "The hard X-ray view of Giga-Hertz Peaked Galaxies", in preparation

Conference presentations:

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1. Guainazzi, M.; Siemiginowska, A.; Stanghellini, C., "X-ray observations of GPS galaxies: probing the origin of radio power in the universe"; COSPAR04-A-00517; E1.3-0043-04; 35th COSPAR SCIENTIFIC ASSEMBLY held in PARIS, FRANCE, 18 - 25 JULY 2004